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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/676,295

09/30/2003

Andrea Urban

10191/3212A

8189

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EXAMINER

AHMED, SHAMIM

ART UNIT

PAPER NUMBER

1765

MAIL DATE

DELIVERY MODE

08/20/2007

PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/676,295	<b>Applicant(s)</b> URBAN ET AL.	
	<b>Examiner</b> Shamim Ahmed	<b>Art Unit</b> 1765	

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 25 May 2007.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-8 and 10-21 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-8, 10-21 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)                                | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                       | 5) <input type="checkbox"/> Notice of Informal Patent Application                       |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

## **DETAILED ACTION**

### ***Response to Arguments***

1. Applicant's arguments with respect to claims 1-8 and 10-21 have been considered but are moot in view of the new ground(s) of rejection.

### ***Claim Rejections - 35 USC § 102***

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. Claims 1-8, 10 and 18-20 are rejected under 35 U.S.C. 102(b) as being anticipated by Laermer (DE 199 57 169A) as evidenced with Reinhard et al (6,077,787).

Laermer teaches an etching process for a silicon body using a plasma comprises coupling a high frequency pulsed high frequency power with the etching body by means of applied high frequency alternating voltage, wherein the power is further modulated with a low frequency at least temporarily (abstract and pages 3-4 of the translated version of the DE 19957169 and figures 1a-1c (provided in PTO-892).

As Laermer et al teach low frequency and high-frequency with respective pulse-break (specifically page 4, paragraphs 4-5), which reads on the claimed limitation of refraining the high-frequency power at least approximately ambipolar plasma is present.

As to the ambipolar plasma, Laermer et al inherently teach the presence of at least approximately ambipolar plasma, which is evidenced by Reinhard et al.

Reinhard et al teach that the etch uniformity follows an ambipolar diffusion during etching a substrate using plasma reactor (col.5, lines 7-12).

Laermer teaches that the low frequency modulation preferably in the range of 50-1000Hz (col.4, lines 10-25) and the plasma is pulsed at a frequency of 10kHz to 500kHz (see last paragraph of the page 3 of the translated version of the DE reference).

Laermer also teaches that the plasma is modulated with time and the intensity of the plasma is modulated between a maximum value and a minimum value (see figures 1a-1c).

***Claim Rejections - 35 USC § 103***

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Art Unit: 1765

6. Claims 11-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Laermer et al (DE 199 57 169A) as evidenced with Reinhard et al (6,077,787) in view of Koshimizu (5,290,383).

Laermer et al discusses above in the paragraph 3 but fail to teach adding an inert gas in the plasma.

However, in a controlled plasma etching process of silicon substrate, Koshimizu teaches the addition of inert gas into the plasma in order to stabilize the plasma (col.14, lines 29-41).

Therefore, it would have been obvious to one of ordinary skilled in the art at the time of claimed invention to combine Koshimizu's teaching into Laermer et al's process for stabilizing the plasma as taught by Koshimizu.

7. Claims 16-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Laermer et al (DE 199 57 169A) as evidenced with Reinhard et al (6,077,787) in view of Hashimoto et al (5,779,925).

Laermer et al discusses above in the paragraph 3 but fail to teach synchronizing the modulation and the low-frequency modulation with one another.

However, Hashimoto et al teach that the RF bias is synchronized with the on/off modulation in order to reduce charging damage with out lowering the through put (col.16, lines 35-42, lines 66-col.17, line 5).

Therefore, it would have been obvious to one of ordinary skilled in the art at the time of claimed invention to combine Hashimoto et al's teaching into Laermer et al's

Art Unit: 1765

process for reducing charging damage and for improved etching precision as taught by Hashimoto et al.

8. Claim 21 is rejected under 35 U.S.C. 103(a) as being unpatentable over Laermer et al (DE 199 57 169A) as evidenced with Reinhard et al (6,077,787) in view of Dockrey (4,799,991).

Laermer et al discusses above in the paragraph 3 but fail to teach that the under etching is performed using highly oxidizing fluorine compound includes  $\text{ClF}_3$ .

However, in a process of silicon etching, Dockrey teaches both the  $\text{NF}_3$  and  $\text{ClF}_3$  can be used as an efficient etchant for silicon (see claims 7 and 12).

Therefore, it would have been obvious to one of ordinary skilled in the art at the time of claimed invention to combine Dockrey's teaching into Laermer et al's process because both  $\text{NF}_3$  and  $\text{ClF}_3$  are functionally equivalent as taught by Dockrey, as Laermer uses fluorocarbon gas ( $\text{NF}_3$ ).

### ***Conclusion***

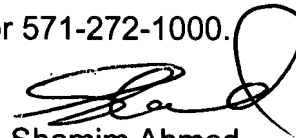
9. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Kamata et al (6,060,329) teach that lowering the high-frequency power leads to suppressed electron density in the zone of plasma generation because the loss of electrons by the ambipolar diffusion is suppressed (col.3, lines 1-18).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Shamim Ahmed whose telephone number is (571) 272-1457. The examiner can normally be reached on M-Thu (7:00-5:30) Every Friday Off.

Art Unit: 1765

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine G. Norton can be reached on (571) 272-1465. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.



Shamim Ahmed  
Primary Examiner  
Art Unit 1765

SA  
August 16, 2007